take a single instance, Magdalen College spends more than 5000*l.* a year upon science professorships, fellowships and scholarships, or a seventh part of its net revenue, and of the last twelve fellowships it has awarded, six have been for research. Also it keeps up a very efficient private laboratory, as, indeed, do five other colleges in the university.

Oxford, January 9. H. M. VERNON.

I THINK that others may interpret the footnote as Mr. Vernon does, and it is therefore my intention to express myself more clearly when the address is republished. Surely all Oxford science men know what I meant to say, and if so, they must know how difficult it is to say it without making two or three particular references. It is evident from other parts of my address that I certainly did not mean that most of the Oxford science professors neglect research. On the contrary, I know that the majority of them perform their duties well, including duties as to research, and they do this in an antipathetic atmosphere such as science professors elsewhere know nothing of. If I had the inclination to punish a scientific man and the power, I would appoint him to an Oxford science professorship.

Some of the most distinguished workers were listening to my address, and I know that they were not much annoyed when I expressed my opinion that, relatively to the position and wealth of Oxford, there is very little being done. We know the names of the Oxford men who are doing good research work in Oxford and elsewhere, and surely Mr. Vernon will not say that they form one-tenth of one per cent. of the number of living men who have been educated at Oxford. But I am not concerned with the easy standard which he is satisfied to apply. I was expressing what is a very general opinion, and one that is certainly my own. Also in saying that Oxford fears and hates natural science I was expressing a very general opinion. It is ridiculed by Mr. Vernon, but he does not disprove it when he tells how Oxford trifles with science by the establishment of what are called science scholarships and fellowships and starved little laboratories.

Public opinion has been burked for many years by this grotesque fooling. Add to this that the majority of the dons throw ridicule upon natural science studies and create an atmosphere in which it is nearly as difficult for a man to do scientific work as it is for a mouse to live in an atmosphere of carbonic acid. An earnest student of natural science swims in a sea of troubles, and the university authorities in their love for him ornament him with a millstone of compulsory Greek as neck ornament. Surely this is something worse than trifling; it is torture. The torture is not so exquisite as what is applied to natural science in schools which are under Oxford influence, but it serves its purpose. JOHN PERRY.

An Undescribed Rudimentary Gill-plume in the Crayfish.

I SHOULD be glad if you would allow me to place on record the discovery, by Miss Margery Moseley (daughter of my old friend, the late Prof. H. N. Moseley, of Oxford), in specimens of the common cray-fish (*Astacus fluviatilis*), of a pair of minute gill-plumes (right and left), belonging apparently to the somite of the first pair of maxillipedes. Miss Moseley discovered these new minute gill-plumes, independently, in the course of dissection of a series of "types" in the department of comparative anatomy at Oxford. Finding no description of them in the text-books, and that they were not recognised or admitted by the authorities, she sent her notes and drawings on the subject to me. The discovery has been confirmed at my request by Dr. Calman, who is engaged in work on the Crustacea at the Natural History Museum, and he expresses his astonishment (in a letter to me) that so important and (when once noted) so obvious an organ can have been overlooked by the many students who have carefully examined the cray-fish since Huxley made it one of his "types," and published his researches on the gills of the astacoid Crustacea.

The discovery is interesting, not only as a fact in the morphology of Crustacea, but as being a novelty in a subject treated with special attention by so skilled an observer as Huxley, and minutely examined by thousands of students and teachers during the last twenty years. Miss Moseley is preparing a description and drawings of the new gill-plumes for immediate publication.

January 15. E. RAY LANKESTER.

A Theory of the Cause of Atmospheric Electricity.

THE idea that the sun sends out a large amount of Becquerel rays has found considerable support in the scientific world, and has been used to explain a number of difficulties connected with cosmical physics, for example, the source of the sun's energy and comets' tails. There is still another old standing difficulty which it appears to be able to solve, viz. the permanent maintenance of the electrical field in the lower regions of the earth's atmosphere. If we take for granted that the sun continually emits Becquerel rays consisting of positive and negative electrons, one would expect the following to be the consequence. Some of the electrons which reach the earth's atmosphere will be absorbed—probably mainly by the water vapour and dust in the lower atmosphere—but according to Rutherford's experiments more positive than negative; thus we may expect a greater number of negative electrons to reach the surface, a corresponding number of positive electrons being held back by the air. We at once see a cause for the positive charge of the air and the corresponding negative charge on the surface. If there were no "dissipation" the result would be a continual charging up of the atmosphere or an ever increasing potential gradient above the earth's surface; but there is dissipation, and it counterbalances the tendency of the electrical field to increase. If we had a constant dissipation the result would be a maximum potential gradient in the daytime and a minimum in the night, for we must assume that more electrons reach the atmosphere in the day than in the night. But we know from Elster and Geitel's measurements that the dissipation reaches a maximum at midday; this will tend to reduce the maximum of potential gradient which would otherwise be reached about that time. This consideration agrees entirely with the fact, for Exner has described the daily variation of the potential gradient as "a simple daily period, distorted by a midday depression." With the fairly constant daily period of the entrance of electrons into the atmosphere, the main determining factor of the potential gradient will be the dissipation; thus we find a maximum potential gradient in the winter with a corresponding minimum dissipation. The relation between potential gradient and dissipation has been thoroughly investigated by Elster and Geitel, and they have found experimentally that that which tends to reduce the dissipation tends to increase the potential gradient," which is just what one would expect from the theory. This theory appears to me to be able to account for a great many more of the problems of atmospheric electricity, but the above will show the general idea. GEORGE SIMPSON.

Projection of Imitation Spinthariscope Appearance.

WITH reference to Sir Oliver Lodge's letter in NATURE of last week (p. 247), might I venture to say that I exhibited to a large audience the nature of the effect seen in a spinthariscope in a lecture which I gave on radio-activity at the Cavendish Laboratory last term? My plan is somewhat similar to that suggested by one of Sir Oliver Lodge's sons, and consists of two black discs rotating in opposite directions in a mechanical slide. The discs have a large number of transparent spots, so that whenever two of these coincide a flash is produced on the screen. The resultant effect is the same as that seen in the spinthariscope. The coincidences can be arranged so as to be most numerous near the centre. J. B. B.

The Diminishing Size of the New Bishop's Ring around the Sun.

IN addition to the notes recently given in NATURE by Prof. Forel, Mr. Rotch and Mr. Backhouse concerning the new Bishop's Ring, I should like to direct attention to the steadily diminishing size of this ring.

Mr. Backhouse says in vol. lxvii. (p. 174) that the middle of this reddish ring in the summer of 1902 was 70° from the sun, but on December 21 it was only 40° from the sun.

The first measurements made by me were on January 9, 1903, when I found the faint reddish ring extending from between 25° and 30° to about 40° from the sun, the mean distance being about 33°. On January 20 several measurements made with an altazimuth instrument gave the mean distance of the middle of the red ring as 30° (see *Science*, N.S., vol. xvii. p. 150, January 23, 1903). On February 24, measured by an altazimuth instrument, the reddish glow extended from 26° to 31° from the sun, the mean being about 29°. On May 13 the average distance of the middle of the ring was by measurement roughly about 30°. On June 26 it was found to be about 26° from the sun. All these measurements were made at Blue Hill between 10 a.m. and 2 p.m., and the distance was measured from the sun vertically upward to the ring.

On September 1 Mr. Rotch, when on the summit of Mont Blanc, measured the distance of the ring from the sun, and found it to be between 20° and 25°, which would give a mean distance of about 23° (NATURE, vol. lxviii. p. 623).

On October 14 I again measured it at Blue Hill with a sextant, and found it extended out to 26°, which would give a mean distance of about 23°. A recent measurement by me on December 28 with an altazimuth instrument showed that it extended from about 16° to 24° from the sun, giving a mean distance of 20°.

Putting these measurements together, the following results are obtained :—

1902			1903				
Aug.	Dec.	Jan.	Feb.	May	June	Sept.	Oct.	Dec.
70° ...	40° ...	... 32° ...	29° ...	30° ...	26° ...	23° ...	23° ...	20°

These results show a very rapid decrease in size at first, followed by a diminishing rate of decrease.

When I began my measurements I had not seen the letter of Mr. Backhouse, and did not see it until about a month ago. I anticipated that the ring would grow larger with time, reasoning that if the ring was a diffraction phenomenon, due to volcanic dust, the larger particles of dust would fall first to earth, leaving the smaller particles, and theoretically this ought to increase the size of the ring. I have been surprised to see the ring grow smaller. Perhaps it is because the whole of the particles causing it are getting nearer to the ground. Inside the very faint reddish ring described above, is a whitish glare which is visible to everyone, but I find that many people are unable to distinguish the reddish ring, which is very faint, and only distinguishable by anyone on the clearest days, and is most distinct when the sun itself is hidden by a cloud.

HENRY HELM CLAYTON.

Hyde Park, Mass., December 30, 1903.

Subjective Images.

WILL you kindly allow me to submit the following case for the consideration of your readers? I was reading a book one day in the open air, and the full light of a strong sun was shining on the printed page. After reading for about half an hour, I went over to a fountain, a few yards distant, in the shade of some trees. On a white marble slab attached to the fountain, there was an inscription, which I knew to be in jet black letters. To my surprise, the letters now appeared to my eye a rich emerald green. So brilliant and persistent was this green that I thought, for a time, that the colour had been really changed. After a few minutes, however, the green hue slowly faded away, and the letters appeared black as before.

The explanation that occurs to me for the moment is that the impression made on the retina by the different colours present in white light, lasts longer for some colours than for others, and that it lasts longest for the green. Thus the retina having been exposed for a considerable time to an intense white light, retained the impression of green after the impressions made by the other colours had faded away, and accordingly those portions of the retina on which the image of the black letters fell would still produce the sensation of green, while that sensation would be practically effaced for the remainder of the retina by the strong white light of the marble slab. It would be interesting, I think, if any of your readers could give evidence of a similar experience, or offer any better explanation of the phenomenon.

GERALD MOLLOY.

86 Stephen's Green, Dublin.

National Science Scholarships.

As a former student of the Royal College of Science and School of Mines, London, S.W., I was much struck by the hard working, studious demeanour of the national scholars I came into contact with at this excellent institution, and it seems to me that they are deserving of a better fate than being compelled to exist in London and to find many college necessaries out of 25*s.* per week, which I understand is only paid them during term time (p. 237). I am proud to be able to number several of these fine fellows among my intimate friends, whose mental calibre makes their companionship an acquisition; the miserable pittance doled out would seem hardly likely to attract such material, and seems to me only calculated, in many cases, to crush the element it professes to foster, and to turn out drudges for the general use and convenience of others possessing healthier digestions and a more extended knowledge of the world in general.

In this age of educational raving, when, apparently, it is assumed that the expenditure of large sums of money on the erection of colossal buildings is the surest way of building colossal minds, it makes one hesitate and wonder what education of any kind means.

Surely the object of scholarships should be two-fold, or more than two-fold, to make *men*, as well as *men of science*, and to educate in accuracy and truthfulness, and manliness also, and not to make mental and physical wrecks by ignoring earthly needs, yet the latter must result in many cases from such false economy. Either the scholarships should be made sound in every way or they should be abolished; the country would at any rate gain by a reasonable number of healthy minded citizens, which no nation can afford to despise in the race of life as it goes on to-day.

I think your suggestion of suitable halls and corporate life a good one; it is a need of the Royal College of Science, it is in fact, a need of all large colleges and universities drawing students from the various quarters of the Empire. The system of halls for a college should, in my opinion, be in miniature representative of the colleges of Cambridge and Oxford, a system which has probably assisted in maintaining the pre-eminence of these universities more than one is at first sight prepared to admit. Each unit belonging to the mother institution striving to obtain good men and fostering them by every encouragement to work for the hall they represent, let each hall have its cherished list of names of prizemen, and thus convert what, in a simple college not possessing such units, becomes a system of pace-making into a healthy, manly, and sportsmanlike competition, in which the honour of the hall is at stake equally with that of the individual, where each will do his best work and be free from that tendency on the part of many high minded individuals to condemn themselves for entering into direct competition with less healthy, less capable men who nevertheless possess qualifications which make them respected by all to whom they are known, for the honour of the hall is a thing apart from self. Such a system would, I believe, tend to advance greatly the beloved institution which many others and myself regard as Alma Mater.

Bedford, January 14. W. H. PRETTY.

The Transvaal Technical Institute.

IN view of various unauthorised statements which have appeared from time to time in the public Press, the council of the Transvaal Technical Institute will be obliged if you will give publicity to the following particulars regarding the arrangements which have been made to meet the needs of this community and of South Africa generally in respect of technical education.

The classes for mining students which for seven years past have been held at Kimberley are being transferred to Johannesburg, and it is expected that some forty students will be in residence here at the beginning of next academic year (February).

To provide lecture rooms and laboratories for these students, the council of the Institute has taken over from Government the lease of the Boys' High School in Kerk Street, while a row of houses in Highfield Terrace will be furnished for boarding accommodation.

The council, aided by a committee at home, is making the necessary appointments to the teaching staff. Already